

## HYDROLOGY AND ENVIRONMENTAL SETTING

The Albemarle-Pamlico estuarine system is characterized by several features that influence and perhaps, in some cases, govern the distribution of sediments and the processes of sedimentation. First, the system comprises large, shallow, fresh-to-brackish bodies of water that have little or no free exchange with the ocean. The Outer Banks island chain, which forms the seaward margin, has only four "permanent" inlets along its 270 km length (Fig. 1). Second, the geometry of the shoreline is complicated, and the major estuaries have different freshwater sources and different orientations relative to prevailing winds. Because the APES area is a system of drowned river valleys, the tributary estuaries are oversized for the amount of water they now carry, resulting in low velocities from freshwater inflow. Third, the tide range is low, and circulation appears to be dominated by wind-driven currents. Maximum tide range (~1 m) is in the vicinity of the inlets but tides are rapidly damped to 10 cm or less throughout most of the APES region.

The few published reports on hydrology and flow dynamics in Albemarle and Pamlico Sounds show that wind, at least in the short term, is the controlling factor in circulation (Roelofs and Bumpus, 1953; Knowles, 1975; Singer and Knowles, 1975; Giese, et al., 1979; Pietrafesa et al., 1986). Average wind speeds are 15 km/hr, but can reach 48 km/hr every month of the year when examined from the standpoint of long-term statistics (Fig. 2). The most important feature of winds is that they blow from the south to southwest between April and August and from the north to northwest between September and February. Although winds in March have a nearly uniform directional distribution, nearly 10% of all winds during the month of March exceed 30 km/hr.

Sea level has had a profound effect on shoreline configuration and depth of the estuarine waters. Albemarle Sound and the Neuse and Pamlico Rivers leading into Pamlico Sound are shallow, drowned river valleys that formed during the last post-glacial rise in sea level which began approximately 18,000 years ago (Curry, 1965). The relatively slow rate of sea level rise during the last 3000-5000 years (1-2 mm/yr) has allowed shoaling and redistribution of sediments in much of the system.

Depths in Albemarle Sound increase gradually with distance from shore to the relatively flat central axis of the sound (Fig. 1). Although the maximum depth is 9.1 m, the average depth is only 5.3 m, and in Croatan Sound, the limb which connects Albemarle Sound to Pamlico Sound, depths are less than 3.6 m (Folger, 1972a). Pamlico Sound is divided into two broad basins by Bluff Shoal, a north-south oriented cross-lagoon shoal adjacent to Ocracoke Inlet (Fig. 1). Bottom topography in the northern area dips smoothly toward the center to a maximum depth of 7.3 m. There are few topographic irregularities other than the shoals of a tidal delta that extends from Hatteras Inlet. In the southern part, where average depths are 5.4 m, two large